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ABSTRACT

0033 A copper filled damascene structure and method for forming the same the method including providing a substrate comprising a semiconductor substrate; forming an insulator layer on the substrate; forming a damascene opening through a thickness portion of the insulator layer; forming a diffusion barrier layer to line the damascene opening; forming a first seed layer overlying the diffusion barrier; plasma treating the first seed layer in-situ with a first treatment plasma comprising plasma source gases selected from the group consisting of argon, nitrogen, hydrogen, and NH₃; forming a second seed layer overlying the first seed layer; forming a copper layer overlying the second seed layer according to an electro-chemical plating (ECP) process to fill the damascene opening; and, planarizing the copper layer to form a metal interconnect structure.